

varies from greenish-olive to yellow-white and this change of colour may be influenced by temperature and sunlight.

When cleaning the tank, a number of teeth of both gharials and crocodiles were found, mostly of the former. Empty spaces in the jaws and growing teeth of varying sizes were observed in the open mouths of the gharials at close quarters. It would appear that the teeth are periodically shed and regrown, one or two at a time. Its teeth are also longer, narrower and more pointed at the tip than those of the crocodile. Those of the crocodile can be easily distinguished by their stoutness, shortness, and the greater number of striations thereon.

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#### 18. HEMIPENAL STRUCTURE IN *ELAPHE RADIATA* SCHLEGEL WITH A DIAGNOSTIC KEY BASED ON HEMIPENIS

The structure of the hemipenis is poorly known in most of the Indian species of snakes and the available information is from M. A. Smith, (1935, *Fauna. Brit. India*, Vol. III); who has himself pointed out '...descriptions considerably vary in pattern and need revision' (op. cit. p. 11). Structure as a systematic tool has been first utilised by Cope, E. D. (1893) whose classification was later modified by Dunn, F. R. (1928) but most comprehensive account of the structure is of Dowling, H. G. & Savage, J. M. (1960). An attempt has been made in this paper to prepare a diagnostic key on the basis of Smith (op. cit.) and certain observations on lepidosis variation in relation to the structure.

#### Hemipenis in *Elaphe radiata* Schlegel

Hemipenis extends to 24th caudal plate and the spinose area is nearly  $\frac{3}{4}$ th of the organ. Spines are of three types: (i) distal spines, 3-4 mm long, pointed with shallow canaliculate depressions and arranged 5-7 each in 9-10 quite distinct horizontal rows; (ii) medial spines, 5-7 mm long with blunt somewhat curved and each having a fairly marked spatulate canal (larger ones around the sulcus); (iii) proximal

spines, 2-3 mm long, pointed and arranged 5-7 each in horizontal rows.

Above description based on the specimens from north India show variation from the description of Smith (op. cit.) in that the hemipenial structure extends to 24th caudal plate and not up to 10th plate.

## DIAGNOSTIC KEY

*Hemipenis extending upto:*

1. Upto 8th caudal plate  
Spines short pointed and throughout  
Proximals few large ones ..... *E. porphyracea*
2. Upto 9th caudal plate  
Spines pointed hard and not throughout  
Proximals all large  
i) a loreal ..... *E. prasina*  
ii) no loreal ..... *E. frenata*
3. Upto 10th caudal plate (upto 24th plate)  
Var. I Calyses deeply scalloped  
Spinose area extensive, rows horizontal  
Proximals short pointed ..... *E. radiata*  
Var. II Other characters same upto 24th caudal plate ..... *E. radiata*  
Calyces calyculate at tip spinose area  
extensive, rows longitudinal  
Proximals few large ones ..... *E. leonardi*
4. Upto 13th caudal plate  
Calyces small pointed  
spinose area relatively small (at distal  $\frac{1}{2}$ )  
rows longitudinal with abrupt transition ..... *E. hodgsoni*
5. Upto 14th caudal plate  
i) Cups deeply scalloped spinose area half,  
calyses calyculate distal spines few, proximals in  
2 small rows (with papilla like process) ..... *E. mandarina*  
ii) No cups  
spinose area more than half, calyses  
small uniform, proximals few large ..... *E. flavolineata*  
Spinose area half or less (other characters same) ..... *E. helena*
6. Upto 17th caudal plate  
Calyces deeply scalloped  
spines blunt, proximals short stout ..... *E. cantoris*
7. Upto 21st caudal plate  
Calyces not scalloped but large thick,  
spinose area short, spines few very large  
Proximals short more in numbers ..... *E. oxycephala*
8. Upto 27th caudal plate  
Other characters same as in S. No. 5 ..... *E. taenura*
9. Upto 28th caudal plate  
Calyces small and scalloped,  
spinose area wide, spines uniform ..... *E. mollendorffi*

The significance of the structure in diagnosis appears quite clear.  
Of the 14 species distributed over India, Burma, Sri Lanka, Pakistan,

Indo-Chinese and Malayan regions, the closest resemblance is between *E. prasina* and *E. frenata* in the orientation of the hemipenial structure. This may be due to closer affinity as also nearly overlapping distribution. There also appears a relation in distribution and length of the structure. Himalayan species (*E. prophyracea*, *E. prasina*, *E. frenata*, *E. radiata*, *E. flavolineata* and *E. cantoris*) comprise one group having structure from 8 to 17 (24 in a var.) caudal scutes. In the group of species distributed in western Himalayas, the hemipenial length is upto 13 to 14 caudal scute; while in species of eastern Himalayas the length of the structure is shorter—with the exception of *E. radiata* which has a overlapping distribution (Bhatnagar 1969). Within Chinese species the aspect deserves further study as neither clear descriptions nor good material is available for study. Within Burmese and Malayan species we find that shorter penis length character repeats but there is an upward trend. However, only a large series of specimens can elucidate the character correctly. Similar situation appears to be within Indo-Chinese species and deserves study in large series.

Himalayan species show a close range of maxillary teeth numbers; number of costals with exception amongst *E. hodgsoni* and *E. cantoris*; ventral scute count variation is 190-236; caudal scute variation from 52-145 and labial count variation appears negligible.

It thus appears that systematic studies on Indian Ophidians deserve a closer study particularly in light of hemipenis character and correlation with lepidosis with distribution. The aspect appears so far neglected.

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